Amendments in the claims

1. (original) An optical fiber terminator comprising:

a) a body exhibiting a substantially uniform refractive index n_b;

b) an input interface for admitting a light beam from an optical fiber into said body;

c) a concave reflective surface provided in said body opposite said input interface for receiving said light beam and reflecting said light beam along a near-normal direction;

d) a convex toroidal reflective surface provided in said body for receiving said light beam reflected by said concave reflective surface and reflecting said light beam along an off-normal direction; and

e) an output surface for out-coupling said light beam.

2. (currently amended) The optical fiber terminator of claim 1, wherein an azimuth angle between said near-normal direction and said off-normal direction ~~taken about a rotation axis that connects the point of incidence of said light beam on said concave surface to the point of incidence of said light beam on said convex surface~~ is less than 90 degrees.

3. (original) The optical fiber terminator of claim 1, further comprising a folding mirror surface for reflecting said light beam within said body.

4. (original) The optical fiber terminator of claim 3, wherein said folding mirror surface is coated by a reflecting material.

5. (original) The optical fiber terminator of claim 3, wherein said folding mirror surface comprises a light-conditioning element.

6. (original) The optical fiber terminator of claim 1, wherein said input interface is a surface located adjacent said convex toroidal reflective surface.

7. (original) The optical fiber terminator of claim 1, wherein said concave reflective surface is a concave toroidal reflective surface.

8. (original) The optical fiber terminator of claim 7, wherein said convex toroidal reflective surface and said concave toroidal reflective surface are adjusted to mutually cancel wavefront distortions in said light beam.

9. (original) The optical fiber terminator of claim 8, wherein said convex toroidal reflective surface and said concave toroidal reflective surface are dimensioned to collimate said light beam.

10. (original) The optical fiber terminator of claim 8, wherein said convex toroidal reflective surface and said concave

toroidal reflective surface are dimensioned to focus said light beam.

11. (original) The optical fiber terminator of claim 1, wherein said body comprises a molding material having a substantially uniform coefficient of thermal expansion.

12. (original) The optical fiber terminator of claim 11, wherein said molding material is an organic polymer.

13. (original) The optical fiber terminator of claim 11, wherein said molding material is a glass.

14. (currently amended) The optical fiber terminator of claim 1, wherein said concave reflective surface and said convex toroidal reflective surface are coated by a reflecting material ~~on the surface of said body~~.

15. (currently amended) The optical fiber terminator of claim 14, further comprising an optical monitor coupled to said body for monitoring an ~~the~~ intensity of said light beam.

16. (original) The optical fiber terminator of claim 15, wherein said optical monitor is coupled to one of said concave reflective surface and said convex toroidal reflective surface.

17. (original) The optical fiber terminator of claim 1, further comprising a light-conditioning element in said body for conditioning said light beam.

18. (original) The optical fiber terminator of claim 17, wherein said light conditioning element is a coating selected from the group consisting of wavelength-filtering coatings, anti-reflection coatings, and polarization-altering coatings.

19. (original) The optical fiber terminator of claim 17, wherein said light conditioning element is a grating.

20. (original) The optical fiber terminator of claim 1, further comprising a light-conditioning element on a surface of said body for conditioning said light beam.

21. (original) The optical fiber terminator of claim 20, wherein said light conditioning element is a coating selected from the group consisting of wavelength-filtering coatings, anti-reflection coatings, and polarization-altering coatings.

22. (original) The optical fiber terminator of claim 20, wherein said light conditioning element is a grating.

23. (original) The optical fiber terminator of claim 1, wherein said input interface is a surface of said body.

24. (original) A monolithic fiber terminator array comprised of a number of optical fiber terminators of claim 1.

25. (original) An apparatus for manipulating light comprising:

a) a body exhibiting a substantially uniform refractive index n_b;

b) an input interface for admitting a light beam into said body;

c) a concave reflective surface provided in said body opposite said input interface for receiving said light beam and reflecting said light beam along a near-normal direction;

d) a convex toroidal reflective surface provided in said body for receiving said light beam reflected by said concave reflective surface and reflecting said light beam along an off-normal direction; and

e) an output surface for out-coupling said light beam.

26. (currently amended) The apparatus of claim 25, wherein an azimuth angle between said near-normal direction and said off-normal direction ~~taken about a rotation axis that connects the point of incidence of said light beam on said concave surface to the point of incidence of said light beam on said convex surface~~ is less than 90 degrees.

27. (original) The apparatus of claim 25, further comprising a folding mirror surface for reflecting said light beam within said body.

28. (original) The apparatus of claim 25, wherein said input interface is a surface located adjacent said convex toroidal reflective surface.

29. (original) The apparatus of claim 25, wherein said concave reflective surface is a concave toroidal reflective surface.

30. (original) The apparatus of claim 25, wherein said body comprises a molding material having a substantially uniform coefficient of thermal expansion.

31. (currently amended) The apparatus of claim 25, wherein said concave reflective surface and said convex toroidal reflective surface are coated by a reflecting material ~~on the surface of said body~~.

32. (original) The apparatus of claim 25, further comprising a light-conditioning element in said body for conditioning said light beam.

33. (original) The apparatus of claim 25, further comprising a light-conditioning element on a surface of said body for conditioning said light beam.

34. (original) The apparatus of claim 25, wherein said input interface is a surface of said body.

35. (original) A monolithic array comprised of a number of apparatus of claim 25.

36. (original) A free space communication system comprising the apparatus of claim 25.

37. (original) A telescopy system comprising the apparatus of claim 25.

38. (original) A method for receiving and guiding a light beam, said method comprising:

a) providing an optical fiber terminator having a body exhibiting a substantially uniform refractive index n_b;

b) admitting said light beam into said body via an input interface;

c) providing a concave reflective surface in said body opposite said input interface for receiving and reflecting said light beam along a near-normal direction;

d) providing a convex toroidal reflective surface in said body for receiving said light beam reflected by said concave reflective surface and reflecting said light beam along an off-normal direction; and

e) out-coupling said light beam via an output surface of said body.

Detailed action

Paragraph 1: objections to the drawings

The drawings are objected to because surface 22 on Fig. 2 is not shown as a convex surface.

A replacement drawing sheet 2 showing surface 22 on Fig. 2 as a convex surface is filed herewith. This amendment is supported by the application as filed, e.g., on Fig. 1. No new matter is introduced thereby.

The office action summary for this office action refers to the drawings as filed on 6/25/2003. However, for the record it is noted that drawings were filed on 11/4/2003 in response to a notice to file corrected application papers. Thus the most current version of the drawings as of this response is sheets 1, 3, and 4 filed on 11/4/2003, and replacement sheet 2 filed herewith.

Paragraphs 2-6: claim rejections under 35 USC 112

Claims 2, 14, 15, 26, and 31 stand rejected under 35 USC 112 second paragraph. More specifically, "the point of incidence" in claims 2 and 26, "the surface" in claims 14 and 31, and "the intensity" in claim 15 are held to lack antecedent basis. "The surface" in claims 14 and 31 is also held to be unclear.

Claims 2, 14, 15, 26, and 31 are currently amended to overcome these rejections.

Paragraphs 7-26: claim rejections under 35 USC 103

Claims 1, 2, 6-8, 10-17, 19-20, 22-23, 25-26, 28-34, and 38 stand rejected under 35 USC 103(a) over US 5,479,543, hereinafter Black, in view of US 5,889,626, hereinafter Fuse.

With respect to claim 1, Examiner has held: 1) that Black teaches a fiber terminal having a body with an input interface and an output surface (claims elements a, b, and e); 2) that Fuse teaches a concave reflective surface combined with a convex toroidal reflective surface (claim elements c and d); and 3) that it would be obvious to combine these teachings. Applicant respectfully traverses this rejection of claim 1. More specifically, Applicant holds that combining the teachings as indicated is not obvious because Fuse teaches away from such combination.

In particular, Fuse is primarily concerned with configurations having two concave reflectors. This configuration is the only configuration discussed in the detailed description (e.g., lines 57-62 of column 4). Furthermore, this configuration is the only configuration that is claimed by Fuse.

Although Fuse briefly considers a combination of convex and concave reflectors on lines 37-58 of column 3, the main apparent purpose of such considerations is to emphasize advantages of the preferred concave-concave configuration compared to the convex-

concave configuration. In particular, the convex-concave arrangement has beam condensing properties which are highly sensitive to tilt of the input optical axis (column 3, lines 55-58), while the preferred concave-concave arrangement of Fuse advantageously reduces the sensitivity of beam condensing properties to variation of input optical axis tilt (line 59 of column 3 through line 2 of column 4). It is noted that Examiner has emphasized Fuse's motivation of stable condensing (last sentence of office action paragraph 9) to motivate the combination of references relied upon for this claim rejection.

However, consideration of the teachings and motivations of Fuse would not lead an art worker to a modification of Black having convex and concave reflective surfaces, since Fuse discourages such configurations. Instead, an art worker may be led toward a modification of Black having two concave reflective surfaces, but this is not the configuration of the present claim 1. For these reasons, Applicant respectfully traverses this rejection of claim 1 and requests reconsideration.

Claims 2, 6-8, 10-17, 19-20, and 22-23 depend from claim 1. Accordingly, the above arguments in connection with claim 1 are also responsive to this rejection of these claims.

Claim 25 has substantially the same elements as claim 1. Accordingly, the above arguments in connection with claim 1 are also responsive to this rejection of claim 25.

Claims 26 and 28-34 depend from claim 25. Accordingly, the above arguments in connection with claim 25 are also responsive to this rejection of these claims.

Claim 38 has substantially the same elements as claim 1. Accordingly, the above arguments in connection with claim 1 are also responsive to this rejection of claim 38.

Paragraphs 27-30: claim rejections under 35 USC 103

Claims 3-5, 27, and 37 stand rejected under 35 USC 103(a) over Black in view of Fuse in further view of US 3,961,179, hereinafter Kuffer.

Claims 3-5 depend from claim 1, and claims 27 and 37 depend from claim 25. Accordingly, the above arguments in connection with claims 1 and 25 are also responsive to this rejection of these claims.

Paragraphs 31-32: claim rejections under 35 USC 103

Claim 9 stands rejected under 35 USC 103(a) over Black in view of Fuse in further view of US 6,625,376, hereinafter Werkheiser.

Claim 9 depends from claim 1. Accordingly, the above arguments in connection with claim 1 are also responsive to this rejection of claim 9.

Paragraphs 33-34: claim rejections under 35 USC 103

Claims 18 and 21 stand rejected under 35 USC 103(a) over Black in view of Fuse in further view of US 4,993,796, hereinafter Kapany.

Claims 18 and 21 depend from claim 1. Accordingly, the above arguments in connection with claim 1 are also responsive to this rejection of claims 18 and 21.

Paragraphs 35-36: claim rejections under 35 USC 103

Claims 24 and 35 stand rejected under 35 USC 103(a) over Black in view of Fuse in further view of US 4,986,762, hereinafter Keith.

Claim 24 depends from claim 1, and claim 35 depends from claim 25. Accordingly, the above arguments in connection with claims 1 and 25 are also responsive to this rejection of these claims.

Paragraphs 37-38: claim rejections under 35 USC 103

Claim 36 stands rejected under 35 USC 103(a) over Black in view of Fuse in further view of US 6,366,723, hereinafter Medved.

Claim 36 depends from claim 25. Accordingly, the above arguments in connection with claim 25 are also responsive to this rejection of claim 36.